



MAGAZINE

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Front Cover: A view of Langdale Pikes, taken from Tarn Howe, by R. G. Farrand (Plastics Division)

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METAL — Servant of Man

This month Arthur Horowicz finds, in one of the Metals Division's most historic factories, a spectacular outlet for his talents. He gives a dynamic impression of the traditional skill that goes hand in hand with modern organisation.

By Dorothy Thomas



A METAL manufacturing plant is in many ways a miniature of contemporary industrial activity, and nowhere is this more apparent than at the Elliott Works of I.C.I. Metals Division. Almost a hundred years old, this came into existence when Birmingham was just beginning to feel the full effects of the Industrial Revolution. Selly Oak, where the factory was built on the

bank of the Birmingham and Worcester Canal, was a collection of two or three cottages hardly meriting the title of village. It is no exaggeration to say that the rapid expansion and continued prosperity of this concern were to a large extent responsible for the growth of Selly Oak into the thriving industrial community it is today.

Now entirely surrounded by noisy streets and bustling factories, Elliott Works wears its history proudly, with an air of disdaining such pretty modern fancies as pale-painted walls and flower-bordered paths. True, some of the most up-to-date machinery in the world makes life easier for the Elliott workers of 1951, but the elderly equipment of the day before yesterday seems unmoved by the intrusion. Metal—dull grey slabs of it, heavy and uninteresting—seems appropriate nourishment for the ceaselessly clamouring jaws of the great gaunt furnaces and the clattering rolls; it is scarcely surprising that the delicate mechanism of much younger plant accepts only predigested fare.

The first stage in any metal fabrication process is refining. To a layman there is something almost miraculous about the way in which an apparently inert mass comes to life. Thrown into a furnace, slabs of copper melt under tremendous heat into a brilliant, shimmering red-gold mass, surging with vitality. But it is not ready yet to continue its lifework. First



FIRST AND MOST DRAMATIC STAGE in the manufacture of wrought metal is refining and casting. From the furnace several tons of molten copper pour into prepared moulds, where they will cool ready for further processing.



WIRE-MAKING BEGINS by passing a heated casting through a series of grooved rolls, which reduce its diameter and increase

its length. As many as twenty-nine passes may be needed to transform the original casting into 500 feet of wire

rod, less than half an inch in diameter. Here the red-hot billet is brought to the first set of rolls.

it must lose some of its oxygen, so into the seething cauldron goes the magic wand of the caster—an ordinary green tree-trunk. Immediately the molten mass reacts, spitting and splashing, and nature's alchemy releases the unwanted gas.

Modern practice normally uses mechanical aid to pour the molten metal into moulds, where it cools into forms (known as ingots or billets) of manageable proportions. In some cases, however, the old method of hand lading is more suitable. Elliott's refining teams carry out this tricky operation with the quiet efficiency of long practice. Five or seven men approach the furnace in single file, dip their long-handled ladles in turn into the fiery mass and, again in turn, pour a steady stream into the prepared moulds, rectangular or cylindrical in shape. With a minimum of effort and movement the process continues without interruption until perhaps 26 tons of molten copper is safely stored.

The direction taken by the ingot or billet depends then upon the purpose for which the metal is required. At Elliott Works the largest rectangular ingots are taken to the Plate Mill, where another fundamental process—rolling—converts them into large flat plates, measuring perhaps 17 ft. by 9 ft.

Does this sound simple? It looks simple, too. Giant "mangles" press out a ton or so of metal—heated again to red heat as easily as a child flattens plasticine. But there is a secret, of course, and it lies in the mind of the man behind the machine. Mechanised conveyors may carry the burden to the mouth of the rolls, but only the roller in charge can gauge accurately the pressure required as the metal passes back and forth.

Plates in both copper and brass are handled at Selly Oak. The brass plates generally finish their careers as housings for the thousands of condenser tubes needed in ships and power stations, those in copper as parts of locomotive fireboxes. Now locomotive fireboxes, as all our railway enthusiasts know, have their own characteristic and sometimes quite complicated shape. The simplest plates made at Elliott Works would be described by the uninitiated as shallow rectangular dishes with a hole in the centre. This pattern is achieved by laying the flat plate on a mould, or template, and hammering the metal into shape against this. Six men wielding heavy wooden mallets may sound a trifle alarming, but perfect teamwork ensures that only the plate bears the brunt of their attacks.

Let us turn aside from the drama of raining hammer blows and follow the course of the copper castings destined to end their days as wire. The first step, again, is rolling, but this time with an important difference.

Weighing up to 160 lb. each, the castings (in size and shape something like attenuated red-hot pillar boxes) reach the Guide Mill. Tipped from the preheating furnace on to a trolley, each billet goes to the rolls—not much bigger than a domestic mangle this time—and undergoes a series of rapid passes to and fro. The difference between sheet and rod rolls is that the latter are grooved round their circumference, the channels diminishing in size as the fat cylinder is stretched into wormlike proportions. Twenty-nine passes convert the casting into 500 ft. of $\frac{1}{16}$ in. rod, and fascinating indeed it is to watch the whole bright-burning length of it race through the rolls, snake over the floor and, directed by a deft twist of the roller's wrist, turn in its tracks to fly through the next groove.

In the sense that it is carried on nowhere else in I.C.I., wire-drawing is Selly Oak's speciality, and a very intriguing one at that. The technique consists of drawing rod through dies of



WIRE ROD, here seen passing through the rolls for the last time, is later drawn through a series of steel or diamond dies which reduce it to its final thread-like proportions.

steadily decreasing diameter, sometimes arranged as a continuous series of up to twenty-two dies. The wire-drawing machines combine extreme simplicity with maximum efficiency, the fastest of them producing wire at forty miles an hour. It is not surprising that the I.C.I. Film Unit found this process most "photogenic," for there is real beauty in the glittering, spinning loops of wire, with the characteristically brilliant colouring of nickel, copper, brass or bronze revealed in all its glory.

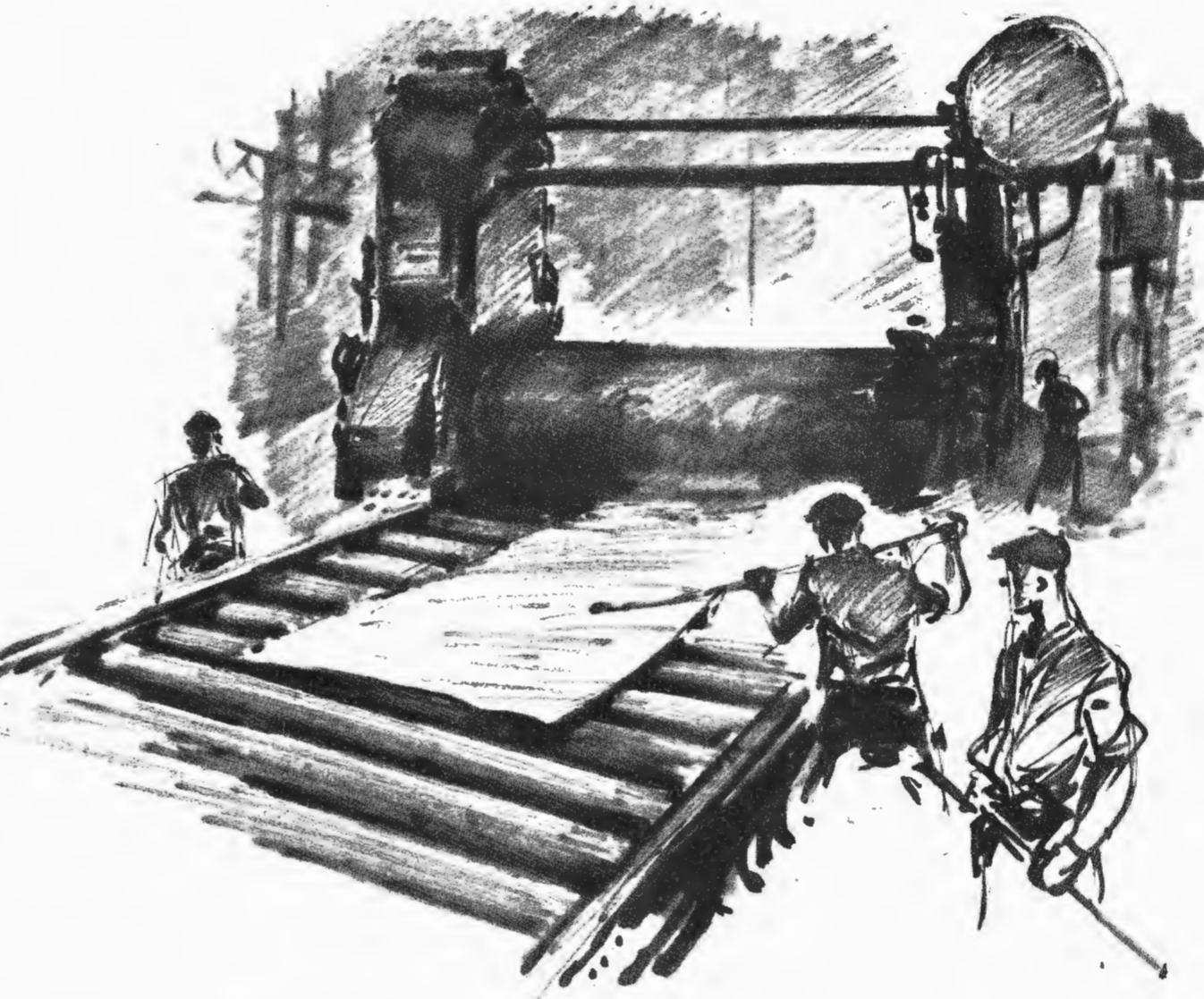
This, then, is Elliott Works. In many ways it is probably typical of hundreds of British metal manufacturing plants—busy, cheerful, noisy, and almost aggressively utilitarian. Typical, too, is its atmosphere of tradition, its pride in past achievements and its ready acceptance of the ever-increasing demands of the present.

The best illustration of this living history is found in the people who work there. Long service is the rule rather than the exception among the 500-odd employees, and a man just on the younger side of 50 might well find himself described as "the kid behind the rolls." Mr. Tom Wood, foreman of the Guide Mill, is an example of another Elliott speciality—family

service. His uncle, Mr. T. Wood, "father of the pensioners" at 93, enjoys the rare pleasure of having two sons, now aged 70 and 67, with him in retirement. Mr. L. G. Hale, in charge of the Plate Mill, has almost caught up with his father's record of 35 years' service in the same shop. Plump and genial Henry Greenway has two brothers, Fred and "Caggy," and two other members of his family, Howard and John, to support him as M.C. of the Saturday night concerts.

Everywhere a pleasant homeliness is in evidence. A chalked message, "No fishing here," reminds Sam Hughes, lively spark of Frank Evans' shift in the Guide Mill, of his leisure-time achievements; a second, straddling a roof-high travelling crane, recalls "positively the last appearance" of a gentleman universally known as "the General." Christian names and nicknames take the place of the Midlands' generic "mate," and a genuine personal interest pervades the shops and offices.

Yes, Elliott Works, despite its long history, shows no decline in vigour. When the year which marks its centenary arrives we may be sure that our colleagues there will still be providing industry and the community in general with one of its basic "raw materials"—semi-manufactured metal.



UNDER CRUSHING PRESSURE from these great rolls, castings weighing up to 6 tons are converted into plates for condensers on locomotive fireboxes.



THE TRADITIONAL SKILL of the metal worker is exemplified in the precision with which flat plates for fireboxes are flanged and shaped by hand hammering.

Information Notes

THE I.C.I.—DU PONT CASE EXPLAINED

By E. A. Bingen (Overseas Director)

The highlight of the Central Works Council at Blackpool last November was an absorbing address by Mr. E. A. Bingen, until recently I.C.I. solicitor and now Overseas Director, on the subject of the lawsuit in the United States in which I.C.I. and du Pont have been involved since 1944. This action opened in New York in April 1950—over six years after the complaint had been lodged—and the hearing lasted three months. Documentary evidence amounting to almost 20,000 pages of print was filed and many witnesses called, the principal I.C.I. ones being Sir William Coates and Dr. Cronshaw. A résumé of Mr. Bingen's talk is printed below.

In his opening remarks Mr. Bingen pointed out that the case affected substantially all of I.C.I.'s interests in the Western Hemisphere, not only the contractual relationships which subsisted between I.C.I. and the American concern, E. I. du Pont de Nemours & Co., on exchange of patents and processes, but also the substantial joint investments which I.C.I. and du Pont owned in Canada and South America. The largest of these investments was Canadian Industries Ltd., a company employing 8000 people, the equivalent of a major Division in I.C.I. but with a greater diversification of interests. There were also, among other joint investments, the "Duperial" companies in the Argentine and Brazil, which had a substantial range of manufacturing interests as well as a large merchanting business in products of I.C.I. and du Pont.

Mr. Bingen made it clear that the proceedings in the United States, in which the Department of Justice—a Government agency—was the complainant, involved alleged breaches of American law and that there was no suggestion that there was anything which I.C.I. had done, in any shape or form, which if it had been done here would have contravened British law. It was not a criminal case, despite press references to the phrase "combination and conspiracy"; it was, indeed, more or less the equivalent of a Chancery action in this country.

Questions had often been asked as to how I.C.I., as a British company, had become involved and had had to defend itself in proceedings which were initiated in the United States. The answer to this lay in the fact of the existence of I.C.I.'s small subsidiary company in New York, I.C.I. (New York) Ltd., the United States court having ruled that I.C.I. (New York) was a mere instrumentality of I.C.I. and that the existence of I.C.I. (New York) as I.C.I.'s resident agent in the United States gave the court jurisdiction over the parent company.

Many people, while appreciating this point, could not understand how a United States court could seek to extend its jurisdiction over I.C.I.'s investments in Canada and South America or over acts done by I.C.I. in those countries. The legal answer to this was that I.C.I., having been found to be within the jurisdiction of the American court, are in no better position than any American citizen, although it was hoped that in practice and as a matter of comity the United States court would not make any order which seriously

affected I.C.I.'s investments or other assets outside the United States.

Mr. Bingen pointed out that the Sherman Anti-Trust Act 1890, under which the proceedings had been brought, made illegal "every contract, combination in the form of trust or otherwise, or conspiracy in restraint of trade or commerce among the several States (of the United States) or with foreign nations."

This act was in origin an attempt to codify the old British law on restraint of trade, but substantial differences of approach to the problem soon developed. In England the Common Law never objected to agreements in restraint of trade unless they were unreasonable as between the parties or injured the public interest. Even with the passing of the Monopolies and Restrictive Practices (Enquiry and Control) Act, 1948—an act which I.C.I. welcomed as long overdue—the concept of public interest was still paramount, and there was nothing to indicate that the Monopolies Commission would necessarily find as contrary to the public interest in appropriate cases arrangements between competitors in the same line of business, whether manufacturers or merchants, under which they had some form of arrangement with each other to regulate prices and conditions of sale, or otherwise to put an end to cut-throat competition.

Everything depended upon the circumstances of the case and on whether the agreements or arrangements in question were designed to increase efficiency and enterprise and had that effect, and upon whether they resulted in the fullest utilisation of men, materials and industrial capacity. These were factors which I.C.I. had always had well in mind in formulating their policy on commercial agreements.

In the United States, on the other hand, the interpretation of the Sherman Act had developed on somewhat different lines, and the tempo of enforcement to some extent depended upon the political climate of the times. Many of the court decisions were hard to reconcile, and although at one time the United States Courts had adopted what was known as the Rule of Reason, which was not dissimilar to the English test of what is in the public interest, they had recently adopted a far more rigid interpretation of the Act, as a result of which virtually any form of agreement between competitors which in any way regulated any kind of trading relations between them was

declared illegal, regardless of the impact—good or bad—on the public interest of such agreements.

In our case it was alleged that the patents and processes agreements which I.C.I. had for a number of years with du Pont and under which the inventions of one party were made available to the other in a widely defined field, for the exclusive use of du Pont in the United States and the exclusive use of I.C.I. in the British Empire, were used as a means of dividing the commercial markets of the world. It was further said that the jointly owned companies—Canadian Industries Ltd. and the "Duperials" and other companies in South America—had unduly restrained American export trade through I.C.I. and du Pont endeavouring to sell their products to these joint companies in quota proportions, and similarly that American import trade had been restrained by virtue of the fact that these jointly owned companies were confined in their sales activities to the territories in which they are operating.

On the patents and processes agreements I.C.I.'s answer was to point out the great technological value to each other and to the economies of their countries of the inventions exchanged under the agreements—polythene and nylon were cited as outstanding examples of inventions reciprocally made available to each other—while I.C.I.'s failure to export its products to the United States in any substantial quantities before devaluation was to be explained, not as arising from any agreement with du Pont, but as a result of economic factors, the main one of which was the American tariff.

In regard to the joint companies, I.C.I.'s answer was to point out that the way in which these companies had been operated and developed was substantially to benefit the economy of the countries in which they were carrying on business. At the same time it was not to be expected that I.C.I. and du Pont, in setting up jointly owned companies in foreign countries to operate on the strength of I.C.I. and du Pont patents and processes, would expect such companies to compete with their own parents.

However, in 1948, before the action came on for trial and in the light of the obvious objection on the part of the Department of Justice to a continuance of the patents and processes agreement then subsisting between I.C.I. and du Pont, this agreement was terminated at the suggestion of du Pont. The disappearance of this valuable agreement left a void in I.C.I.'s relations with the United States, and much thought was given to the resulting position. It was not, however, until the devaluation of sterling in September 1949 that any substantial volume of I.C.I. products could be exported to the United States. Since then undoubted strides have been made and, in addition, I.C.I. early in 1950 acquired a controlling interest in Arnold, Hoffman & Co., a company engaged in the manufacture of dyestuffs and certain other products in New England. This for the first time gave I.C.I. a stake in manufacture in the United States as well as a medium through which certain I.C.I. products made at home could be readily sold in that market, and the venture was being watched with much interest.

Six years' delay

Reverting to the case itself, Mr. Bingen pointed out that the trial of the action finally opened in New York in April 1950—over six years after the complaint had been lodged—and the hearing lasted three months. The documentary evidence filed by both sides was voluminous—almost 20,000 pages of print, going back over years of history—and in addition many wit-

nesses were called to testify to the court on dealings between the two companies. On the I.C.I. side Sir William Coates and Dr. Cronshaw were among those who gave evidence, and it was clear that I.C.I.'s witnesses created a great impression on the court.

None the less, when the judge's opinion on the law and facts was finally available in September 1951 it was found that the court had, relying largely, it seems, on the documentary evidence, found in favour of the United States Department of Justice on the main issues, holding the agreements and the joint company arrangements to be in violation of the Sherman Act. The judge's opinion was a lengthy recital of the facts, running to over 200 pages, and it was interesting, after reading through 205 pages, to find the judge using the following phrase: "Similarly do we deem irrelevant any enquiry into whether the arrangements between the parties actually injured the public interest or whether the public benefited thereby." That, Mr. Bingen thought, was a very striking commentary on the difference between British and American law.

Here, after a trial lasting months and preparation lasting years, there was a condemnation of agreements regardless of whether these were economically good or bad agreements and whether the American or British public benefited from them or the reverse. That was very different from British law, where the concept of public interest was paramount.

Uncertain future

After pointing out that the whole matter was not yet concluded, Mr. Bingen refused to prophesy on the future course of events. He said that proceedings were now opening on the form of decree to be entered following the judge's opinion.

The Department of Justice were asking for a wide measure of compulsory licensing of United States patents owned by I.C.I. and du Pont, under which technical information would also have to be made available to the licensees; they were also asking that some plan should be worked out and submitted to the court in reference to the joint companies; such a plan might involve either I.C.I. or du Pont, or both of them, selling their stock interests in Canadian Industries Ltd. and the South American companies, while as an alternative, in the case of I.C.I., a segregation plan involving the establishment of two separate companies in Canada, one to be owned by I.C.I. and the other by du Pont, would be acceptable.

Both I.C.I. and du Pont were resisting these proposals, which in their view represented a form of remedy which was not warranted, either by the law or the facts of the case, and there was a possibility, although it would be unwise to be optimistic, of some form of decree being entered into which would be far less drastic than this and yet meet the demands of justice. If, however, things turned out more adversely than was expected, there was always the possibility of an appeal to the Supreme Court in Washington. These things took time, and it might well be a matter of some years before the whole matter was finally resolved.

While I.C.I. had had a fair hearing and had nothing to complain of on this score, Mr. Bingen ended by expressing the view that a judicial tribunal was not really appropriately adapted to consider cases of this kind, where legal issues were so closely intermingled with commercial and economic problems, and he ventured the opinion that the Monopolies Commission set up in this country was a more appropriate form for the investigation and discussion of such complex issues.

THE PLASTIC AEROPLANE

Contributed by Plastics Division

Not long ago the Ministry of Supply announced the experimental development of a new aircraft construction technique in which a specially strong plastic, moulded to shape, was used. Structures made by this method could, it was claimed, be manufactured quickly with comparatively simple tools, and plastic aircraft made more cheaply were forecast. Here a Plastics Division expert explains what this new development is.

THE use of plastics by the aircraft industry is, of course, not new. Since 1936 'Perspex' has been the standard material for glazing both civil and military aircraft; the Mosquito light bomber was a wooden aircraft bonded with urea formaldehyde resins; and laminates of glass cloth bonded with low-pressure polyester resins such as 'Nuron' have long been in use for the construction of radomes and other electrical transparencies and for prototype fuselage sections.

In general, however, plastics have not been used for the construction of airframes, either because they could not compete with metals in performance or, where their performance was adequate, because their use was not economical owing to fabrication difficulties.

The important properties in a material for the construction of airframes are lightness, strength and stiffness. These properties must be combined; no one can be sacrificed to any of the others. Materials that have high strength/weight and stiffness/weight ratios are therefore required, so that, although light and comparatively thin sections are used in construction, the resistance of these sections to both fracture and bending will be great enough to withstand the stresses that aircraft in flight are subject to.

Laminates in which glass fibre is bonded with polyester resin are not suitable for airframe construction; the structures would have a high strength/weight ratio but would lack the necessary stiffness. Plastic laminates of asbestos bonded with phenolic resin are light and have both the strength and the stiffness required, but were originally thought to offer no advantages over metal because they were difficult to mould. Recently, however, simple, inexpensive techniques for moulding asbestos phenolic laminates have been devised, and aircraft wings made of the material have been tested.

The asbestos phenolic laminates that have been used are manufactured by the Turner Brothers Asbestos Co. and

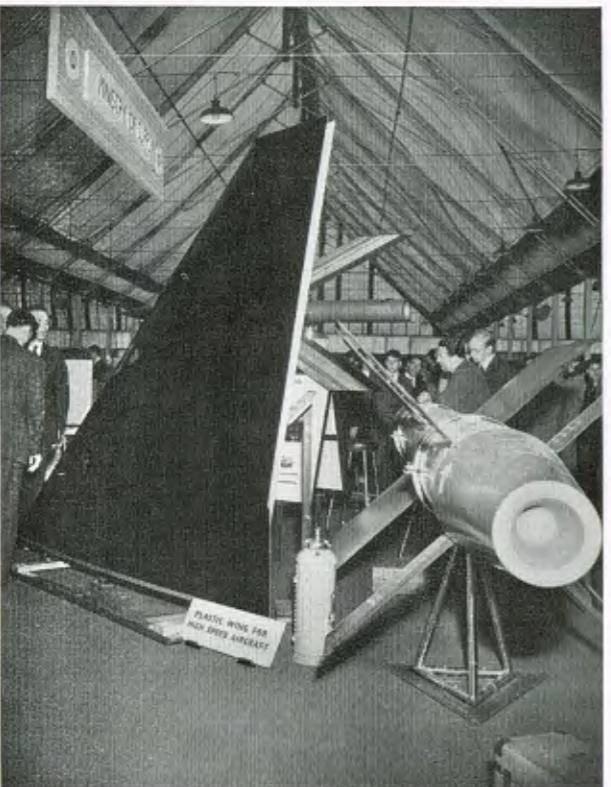
supplied as large sheets of asbestos felt already impregnated with resin. The sheets are easy and clean to handle before curing, thus simplifying the moulding operation.

Two methods of moulding have been devised. The first is a vacuum-bag technique similar to that used in moulding 'Nuron' glass cloth laminates. The resin-impregnated asbestos is placed in an open female mould and covered with a thick porous pad. Outside this a rubber bag is placed and then the air between the rubber bag and the asbestos is completely drawn off, creating a vacuum, so that the bag is forced by the atmosphere surrounding it on to the asbestos. The mould is heated, and the combination of heat and atmospheric pressure completes the cure by causing the resin first to soften and flow among the asbestos fibres and then to set.

In the simpler method of moulding the laminates no pressure at all, in the usual sense of the word, is used. Before being placed in the open mould the asbestos felt is soaked in a water-soluble resorcinol resin which locks the fibres in position. The mould is then heated and the heat cures the phenolic resin.

This method of moulding is suitable only for the construction of quite simple components, but its advantage is that it requires only the most simple equipment—wooden formers being suitable when only a few mouldings are to be made. The vacuum-bag technique is more efficient and produces a finished material of superior properties and higher accuracy of contour.

In practice both techniques have been combined in the fairly complex mouldings required for the wings so far tested, the vacuum-bag technique being used for moulding the shell and the open mould method for the inner structure. Complete test wings of the same section as the Supermarine "Spiteful"—8 ft. long and of 67 in. chord—have been moulded and were found on test to be 18% better on strength/weight ratio and 15% better on stiffness/



(By courtesy of Plastics)

weight ratio when compared with the nominal properties of a similar wing of metal structure.

At the recent S.B.A.C. exhibition an asbestos-phenolic delta wing was on show. This was of double-skin construction, the outer skin presenting a highly polished continuous surface unbroken by joints or by the heads of fastenings, all of which were hidden in the inner skin. (One of the great advantages that the plastic laminate brings is the easy production of perfectly smooth wing surfaces by the use of double-skin construction methods.) Complete results of tests on the delta wing have yet to be published, but it is stated that numerous tests have already been carried out.

It seems likely that successful plastic aircraft structures will differ radically from metal ones because, while the stiffness/weight and strength/weight ratios of the laminate are of the same order as those of the better light alloys, their specific gravities differ considerably. A plastic and a metal structure designed to fulfil the same purpose may, therefore, be very different in shape and size.

The designer is thus presented with new problems. It already seems practicable, however, to construct plastic airframes as light as or lighter than their metal equivalents in such a way that the advantages of the new material are fully exploited.

THE PROS AND CONS OF PROFIT-SHARING

By S. P. Chambers (Finance Director)

No speaker at Blackpool Central Council last November commanded greater attention than Mr. Chambers on the subject of profit-sharing. He spoke in response to an item on the agenda urging the adoption of some kind of profit-sharing scheme within the Company. Here is the substance of his remarks.

PROFIT-SHARING is a grand idea, and it is quite natural that everyone should support it. But it is a very difficult problem, requiring careful examination. What we have to consider is this: What is it going to cost the Company, and where is the money coming from?

Before answering that question, let us have a look at the problem of profit-sharing generally. First, it is not a new idea. It started back in the nineteenth century, for reasons which today would be regarded as thoroughly bad. The two main reasons were to sidestep claims for increased rates of pay and to serve as a substitute for pension schemes. Now, our reasons for adopting profit-sharing would not be these, but that does not mean that the scheme would automatically succeed. In the past, profit-sharing, both in Britain and America, has failed frequently, and less than 2% of the people engaged in industry in these two countries are now partaking in such schemes.

I think it may be said that the main purpose of a profit-sharing scheme would be to improve the relationship between the Company, as an employer, and its employees, in order to get all the employees to take a deeper interest in the progress of the Company. We could not expect productivity to increase as a result of profit-sharing; analyses of British and American schemes show that only in concerns employing thirty or forty people or fewer does profit-sharing add to any individual's performance—and there are more than 100,000 of us.

Before going on to consider the purely financial aspect of profit-sharing, let us look into the reasons why these schemes fail sometimes. One reason is that the scheme is not sufficiently understood; then, when times get bad and the profit shared becomes small, there is dissatisfaction and disappointment—even hardship. Another reason is that the scheme has not been properly thought out before being put into operation; one large company in America abandoned profit-sharing because it had brought only bitter disappointment to employees, for reasons which might have been foreseen before it was put into operation. There are plenty of such instances on record, all of which contribute to the view that a bad profit-sharing scheme can do more harm than good.

Where is the money coming from? I suggested we should ask ourselves. I want to dispel any idea that I.C.I. are doing

so well that the £10 million, or anything like, could be given away. Of the £226 million received in 1950, £135 million was paid out for raw materials and power and other items in that category: that cannot be cut. £47 million was paid out in wages and salaries; and I think you will agree that that item cannot be cut. £4 million went in pensions; but you do not want to cut down contributions to the Pension Fund. £9 million was allocated to depreciation of plant; we must maintain the capital of the Company to keep up its productivity. £12 million went to overseas and United Kingdom taxation—just try to retain any of that! £13½ million went in additions to reserves, and was made up largely of £9 million for replacement of plant and stock—the inflationary element in stock—leaving only £4½ million for expansion of the Company. And £5 million went to stockholders, allowing them about 5% on their money.

There is no question, therefore, of a profit of £10 million being available to share out. Nor can we push up prices to get the extra money; the Company has a responsibility to the general public as well as to its workers and stockholders.

I do not say that profit-sharing is basically unsatisfactory. There are two major kinds of scheme. One is the distribution of cash and the other the distribution of shares. In either scheme the amounts are liable to tax, and it would need a great deal of complicated arrangement to give an equal net share to everybody. With the cash there is also this difficulty: if you make a regular payment, people come to expect it—perhaps rely on it for their holidays—and then, when the Company's profits fall, they are in difficulties. They feel let down.

Nowadays profit-sharing in the form of giving shares in the company must be accompanied, I think, by a cash payment to meet the tax which you must pay on the value of the shares. In one scheme in existence at the moment the bonus is paid partly in shares and partly in the cash with which to pay the tax on the shares. But here again the net income is small. In other schemes the employees are given a special class of share and have no voting rights, nor can they sell their shares; they are not stockholders, in fact, in the ordinary sense of the word. In yet other schemes they are entitled to sell their shares and are generally treated as ordinary stockholders.

BRINE PUMPING AND THE PROBLEM OF SUBSIDENCE

Contributed by Alkali Division

The pumping of brine has for long been a source of difficulty in Cheshire, since the extraction of the brine causes an underground cavity. Sometimes the roof of this cavity is not strong enough to support the ground above it and the ground subsides, occasionally with damage to property. Here an Alkali Division expert explains the steps that are today taken—or about to be taken—to overcome this problem.

NATURALLY occurring salt springs were known in Roman times in the Northwich district, and the brine from them was used to produce salt by evaporation in small heated pans. Without any intervention on man's part salt was slowly being dissolved away from under the ground and cavities were being produced, though at a slow rate. The same sort of thing happens much more slowly by natural means in limestone country, where in the course of geological time large caverns are formed underground by the very slow solution of the limestone by water percolating through it. There must have been times when these cavities reached such a size that the roof fell in. Cheddar Gorge in Somerset is held by geologists to have been formed by the collapse of the roof of a long underground cavern through which a river flowed.

Underground Reservoirs Tapped

Early human settlements in Britain occurred where water was available, from either streams or springs. At a later date the inhabitants started to look for water by sinking wells to tap underground sources collected in porous rocks. In exactly the same way, when naturally occurring brine springs proved inadequate for the needs of salt manufacture, boreholes were sunk to tap the underground reservoirs of brine. As the brine was pumped to the surface, water found its way underground and caused the salt to dissolve at a much more rapid rate than was occurring by natural means to feed the brine springs. It was not long before large cavities were produced underground and subsidence of the surface took place. Subsidence did not necessarily occur near a borehole, but often at a considerable distance from it at a point where water was able to find its way down to the salt by percolating through the rock above.

As brine pumping in Cheshire increased, so more damage was done to property by subsidence, and a Compensation Board was set up to levy rates on brine pumpers so that there might be accumulated a fund out of which to compensate those property owners who could prove that they had suffered damage as the result of subsidence caused by brine pumping.

For some years past the Alkali Division has been winning its brine by controlled methods which are believed to rule out the possibility of subsidence taking place indiscriminately at a distance from the boreholes. In the opinion of the Alkali Division, the only possibility of subsidence is immediately adjacent to the boreholes themselves, which are sited in open

country. The aim of the controlled method of brine pumping is to prevent subsidence of any kind by limiting the size of the cavities so that there is adequate strength to support the roof of the cavity.

The Compensation Board referred to above was set up in 1896 under the provisions of an Act of Parliament passed in 1891 for an area comprising the Northwich urban district and a small part of the Northwich rural district. The board levies rates on the brine pumpers within this area, and the money so raised is given to property owners who are able to prove that they have suffered damage as a result of brine pumping subsidence. The maximum rate which the board is empowered to levy is 3d. per 1000 gallons, but in fact the rate over the past fifteen years or so has been only 1d. per 1000 gallons. Although there are three other brine pumpers in the area, the Alkali Division in fact pays about 95% of the levy.

For more than twenty years there have been complaints from other parts of Cheshire that damage by brine pumping is being caused there and that aggrieved property owners are unable to obtain compensation as no compensation boards exist for those parts. In consequence the Cheshire County Council are promoting a bill in the present session of Parliament with the object of dissolving the present Northwich Salt Compensation Board and setting up a new board to cover all those areas of Cheshire where subsidence due to brine pumping is occurring. The necessary resolution to promote the bill has been passed by the county council.

New Control Measures

In common with all the other brine pumpers, I.C.I. has seen a print of the bill. From our point of view the main feature of interest is that the bill contains a clause providing that brine pumpers who use the controlled system shall receive a rebate. The rebate is to be two-thirds. In other words, if the rate levied by the board is 3d. per 1000 gallons, it is proposed that the controlled brine pumpers shall receive a rebate or discount of 2d. per 1000 gallons. The bill further proposes to increase the maximum rate per 1000 gallons from 3d. to 6d., and it also has a provision that by ministerial order the maximum rate in any year can be increased to 9d.

The Company has sent its observations to the county council. It has stated that provided the maximum levy can be mutually agreed the bill is one which in broad principle is acceptable to the Company.

The making of AZO PIGMENTS

One of the most colourful of all I.C.I. processes is the making of azo pigments at Blackley. This article brings you some remarkable pictures taken by our own cameraman while the work was actually in progress.

At Blackley they make azo pigments in all the colours of the rainbow, but the chief products are scarlet, yellow and blue. When you enter the shed where azo pigments are made, these three colours stab at your eyes from fifty different sources: from vats, from trays, from casks, from filter-presses, and from the shovels of the men at work.

Pigments can be considered as insoluble dyestuffs, which are dispersed rather than dissolved in the media, such as water or oil, by which they are applied. They give their colour to an object by being spread over it in the form of fine particles, just as the inks containing yellow, red, blue and black pigments were spread over the paper to print the coloured pictures on these pages.

There are three types of pigments: organic pigments, which result from a complicated chemical synthesis, inorganic pigments made from metal compounds, and others which are partly organic and partly inorganic. A class of pigments known as azo pigments is the most important of the organic group.

During a typical manufacture the two main components of the pigment are dissolved in separate vats and then fed by gravity to a large coupling vat. "Coupling" is the name given to the chemical reaction which takes place when the two liquids are mixed together.





CRUSHED ICE TO CONTROL TEMPERATURE is here being added to a vat. Leonard Farrell is carrying out the operation during the manufacture of an azo dyestuff.

On the exact chemical nature of each depends the colour of the pigment produced.

To the chemist, the reaction between these two colourless liquids represents a rearrangement of molecules, with results that have been foreseen in the laboratory. To a casual on-looker, ignorant of the chemistry and physics of the subject, events in the coupling vat smack of alchemy. The two components, practically innocent of all colour, are separate; now they come together in the great vat, and almost at once the colour develops. With the foamy "head" it acquires from continual agitation, each vat of colour seems almost like a potion fit to drink, canary yellow, prussian blue or pillar-box red. But no canary ever seemed so yellow and no pillar box (although it is this pigment the G.P.O. use on pillar boxes) so red as the pigment when it hangs suspended in hundreds of gallons of swirling liquid in the coupling vat.

The contents of the coupling vat are filtered and discharged from the filter-presses in the form of a sticky paste, which must be dried in hot-air ovens. After leaving the ovens it is tested and examined in the standardising department for qualities one might expect everyone to take for granted, considering how many batches of pigment have been made.

They say at Blackley that nearly three-quarters of a century of pigment-making has taught them one thing for certain: that the process of manufacture demands not only skill and care, but that it must be performed with great accuracy. Minor



ONE OF THE MAIN CHEMICAL INGREDIENTS of an azo pigment, β -naphthol, is here being dissolved in a vat preparatory to coupling with other chemicals

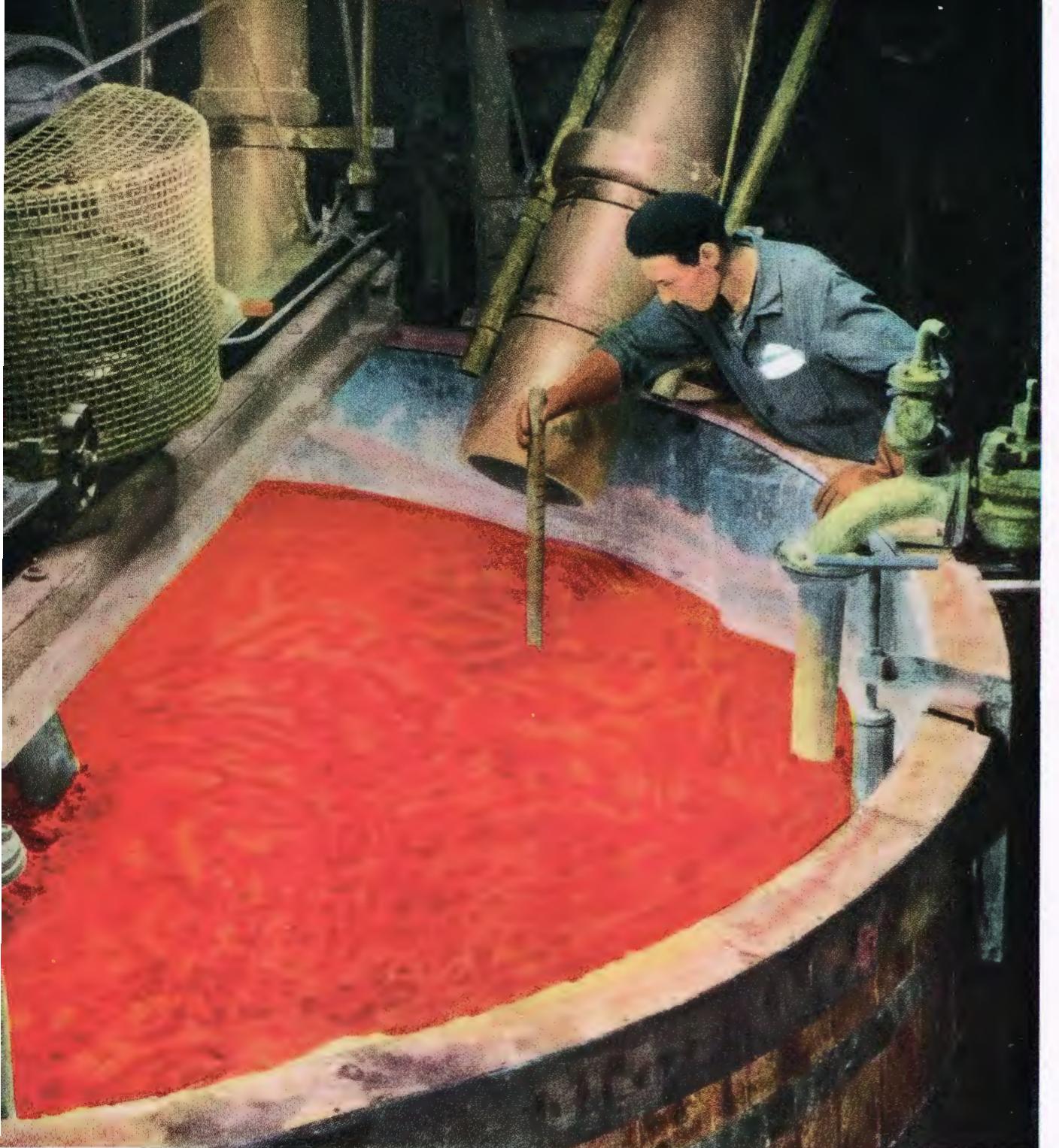


THE BIRTH OF A PIGMENT. In this vat the chemicals are coupled together, a surface froth being created through rapid stirring.

differences in the method of manufacture may make major differences in the properties of the pigment. Each batch of pigment is regarded as a separate achievement; but in spite of the care taken by process workers and chemists, each batch tends to vary minutely, and it is finally made to conform to a rigid standard of quality by being ground and blended with other batches.

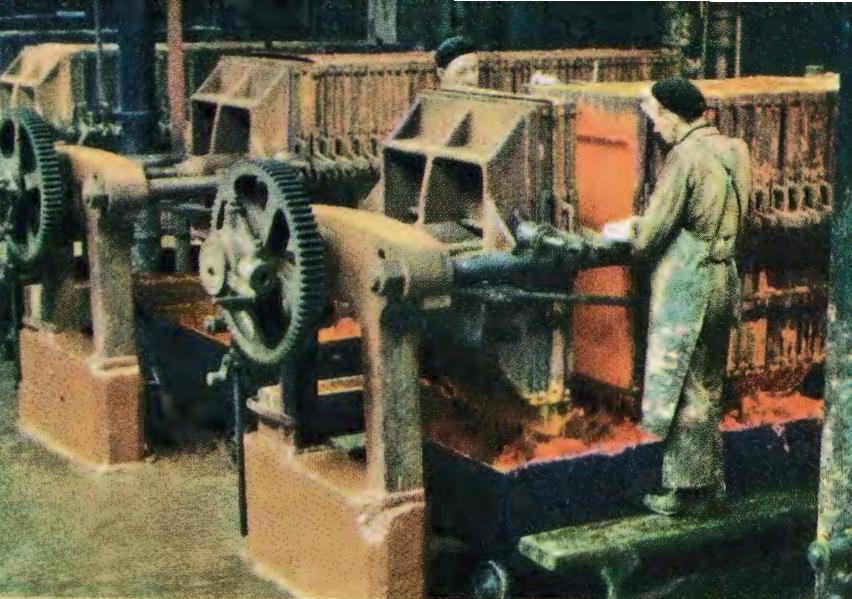
Although scientific control is the most important factor in the making and standardisation of azo pigments and is the means by which consistent quality is maintained, the human eye of the expert is still largely unrivalled as a judge of whether the pigment conforms to standard in the matter of colour. But other important physical properties of pigments depend on particle size and shape, and as some particles of a pigment may measure less than ten thousandths of a millimeter across, the unaided human eye is of little use here. Even microscopes were inadequate for the purpose of research into the particle size of very finely dispersed pigment pastes until the electron microscope came on the scene and made it possible to see a speck of pigment as easily as a handful of breakfast cereal.

Constant research on pigments in the laboratories of Dye-stuffs Division has led to more brilliant shades, better fastness to light, and increased resistance to exposure—qualities which are reflected in the colours of the buses, telephone kiosks and posters in the street, and in such things as the leather finishes, bookcloths, wallpapers and paint-work we see in our homes.



CHECKING THE CONTENTS OF A VAT. Process chargehand Jimmy Long, who is here using a dipstick, supervises several manufacturing units from start to finish of the process.

A BATCH OF COLOUR IS DISCHARGED from the filter press by Harold Wild and Arthur Scottock. When all the frames have been unloaded the men will reassemble the press in readiness for the next batch of colour—a process requiring considerable care to see that cloths are correctly positioned and lie flat on the frames.



A YELLOW PIGMENT PASTE from another press is loaded on to trays by Charles Hewitt. The trays are then placed on racks and wheeled into the drying stoves, which are maintained at a constant temperature until the colour is dry.



RACKS OF DRIED COLOUR are withdrawn from the stoves by Sam Thomason. The colour is next discharged into containers for taking to the grinding and mixing department.



1951 Holiday Snapshots



Lac des Cygnes

First Prize

S. Pollard
(Alkali Division)

Second Prize

D. S. Smith
(Treasurer's Department
Nobel House)

The Lure of the Sea



Hi! Mum!

Third Prize

L. Swarbrick
(Castner-Kellner)

Mr. Charles Wormald, Manager of the Kynoch Press Studio, who judged the competition, writes:

In the snapshot competition this year the first prize goes to Mr. S. Pollard of the Engineering Department, Alkali Division, for his picture of some swans. Snaps of swans appear in many photographic competitions, but this is a good one and has that little something the others haven't got, that is to say, composition and lighting. For this and other prints submitted by him Mr. Pollard is to be congratulated. His entry was far and away the finest sent in.

The second prize goes to Mr. D. S. Smith of Head Office, Treasurer's Department, for his snap of two children against a wave, which conforms to all the copy-book rules of composition dear to the heart of all amateur photographers who know their stuff and also is a true snapshot of the best type.

The third prize goes to Mr. L. Swarbrick of Castner-Kellner Works, General Chemicals Division. This is more conventional—the happy snap. It has a nice feeling of the open-air holiday.

On the whole, the entry this time was neither so high in performance nor so heavily entered as last year.

J. T. Walker

(Billingham Division)

MEET Tommy Walker of Billingham. Or, to give him his full description, John Thomas Walker, Senior Charge-hand Pipe Joiner, of Services Section, Engineering Works. He is a sprightly little man of around five foot two, with a ruddy complexion and merry blue eyes, and looking a good deal younger than his 64 years.

Tommy's job is pipes. Pipes of all shapes—and all sizes, from two inches to seven feet in diameter; pipes for cooling and process water, drains and sewers; the laying of new pipes and the repairing of old pipes. What he does not know about pipe laying and jointing, and Billingham's vast underground pipe system, is not worth knowing, anyway.

Coming to Billingham in 1925 with experience as a pipe joiner gained while working for the Tees Valley Water Board, Tommy found himself caught up with the factory's huge construction programme.

When he came to work in those early days Tommy never knew when he would be home again. Often he was on the job up to thirty-six hours at a stretch, and more than once he and his engineer worked up to their necks in mud and water the whole night through to repair a burst water main.

Few men have done as much in the factory—or outside it—to foster the community spirit. When he came out of the Army in 1919, having served five years as a shoeing smith in the Artillery—"mules are nearly as obstinate as pipes"—he became the first local secretary of the United Services Fund, later to become the British Legion. Shortly afterwards he was one of the foundation committee of the Billingham Social Club and, a few years later, helped to found the Billingham Conservative Club. In the factory he was one of a few who started the Services Social Section—he still takes an active part in it—and was its chairman for many years. He was captain of both the soccer and cricket teams and is still one of Synthonia cricket XI's keenest supporters.

Some years ago—with an eye to the future and to take up what spare time he had left—Tommy Walker acquired a bit of land and set himself up in business as a smallholder, pig-keeper and greengrocer. He erected a small warehouse and pig-styes, and bought a horse and cart for house-to-house delivery. Helped by his two sons—one is a foreman in Cassel Works—he built up a pretty good business to which he could devote his whole time when he retired from I.C.I. But Tommy's plans have not worked out as successfully as he thought. The local authority has taken most of his land for a memorial park, and he thinks they will requisition the rest.

If he loses his bit of land he will probably try to find another plot—or look round for something else to do. You cannot keep a good man down. Tommy Walker, born 1887, is—like his famous namesake—still going strong.



I.C.I. NEWS

RETIREMENT OF MR. H. O. SMITH

MR. H. O. Smith retired from the Board of the Company on 31st December. His connection with the Company goes back to 1918, when, at the end of the war, Explosives Trades Ltd., later known as Nobel Industries, was formed.

Mr. Smith's first job in Explosives Trades was as assistant in London to Mr. B. E. Todhunter. In 1923 he went to Birmingham as assistant to the General Manager, who was then in charge of that group of Nobel Industries consisting of Kynoch Ltd., King's Norton Metal Co., John Marston, and the Excelsior Radiator Co. These firms were concerned mainly with the manufacture of military and sporting ammunition and non-ferrous metal products. The Group also numbered among its manufactures such diverse products as large gas engines, petroleum boilers, candles, steel nails, bicycles, and other products bearing little if any relation to the main purpose of the Group.

Mr. Smith urged that the future of the Group lay in abandoning unprofitable lines and concentrating on the manufacture of wrought non-ferrous metals and those products directly dependent upon them.

By 1936, when he left Witton to join the I.C.I. Board, the Metals Group had been strengthened by the addition of other long-established metal manufacturing companies, and had become a closely integrated and efficient large-scale unit of the non-ferrous metal industry. There is little doubt that the success of the Division today had its foundation in the skill with which personalities in the different companies were brought together under one head.

Another development which should be mentioned is that, even before the formation of I.C.I., Nobel Industries had realised the potentialities of the slide fastener, and it was under Mr. Smith's guidance that Lightning Fasteners Ltd. was formed, with factories in France, Germany, Austria, Switzerland and Spain.

The apparent ease with which Mr. Smith carried out these operations and the enthusiasm with which he, as Chairman, infected his staff throughout the Group are an indication of the exceptional qualities of leadership which he has always possessed. All at Witton in those days will bear witness to the inspiration they derived from him, the respect and affection in which he was held, and to the happy atmosphere in which the work was done—no doubt helped by the lively interest in the social side of factory life taken by both Mr. and Mrs. H. O. Smith.

Mr. H. E. Jackson, chairman of Metals Division, contributes the following reminiscences:

It was during Mr. H. O. Smith's chairmanship—what I can best describe as the formative years of the Metals Division—that I personally feel he did some of his best work for I.C.I. He was very much in the picture during the concentration of Ely, Nobel and Kynoch ammunition production at Witton, and he was in the thick of the negotiations which gradually enlarged I.C.I.'s in-

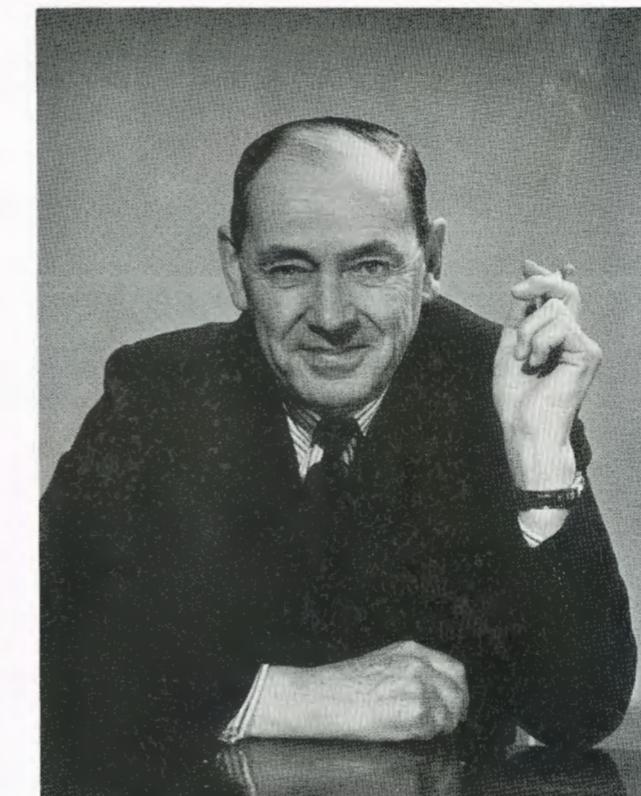
terests in the non-ferrous metal industry.

He was to my knowledge a first-class cricketer, a good golfer, and I believe a very good all-round sportsman in his day. He certainly gave of his time and leisure on the welfare and sports side of the Metals Division.

He had a most difficult task to accomplish when he was sent to Witton, but he carried out his duties fearlessly, and there could be no doubt whatsoever that the Division parted with him with a heavy heart.

Dr. C. J. T. Cronshaw, who has been Joint Personnel Director with Mr. H. O. Smith, writes:

H. O. Smith was born into a large family, being in fact an eighth child, a circumstance which is signified by the second of his Christian names. Thus at an early age he had unusual



(Photo: Douglas Glass)

opportunities of observing how varied is human nature and an equivalent opportunity of acquiring some measure of skill in adjusting himself to a fairly full pattern of human behaviour. His grandfather was one of the founders of the firm of Bickford Smith, the pioneers of safety fuse manufacture, and in due course the Company came under the control of his father, Sir George Smith.

Despite the fact that there were Bickford factories in many parts of the world, it was not intended that H. O. Smith should join the family business. After leaving the Leys School, he went to Bristol to improve his knowledge of mathematics, which he admits is still elementary. He worked under an eminent naval architect who had retired, and says he got no further than learning how to work by pulleys an enormous slide rule attached to the wall of his tutor's room. Much of the rest of his time was occupied in playing football and cricket, and he remembers with some pride the suggestion made to him that he should qualify by residence to play cricket for Gloucestershire.

This studentship did not endure long, and H. O. Smith became an engineering apprentice with Ruston and Hornsby in Lincoln. After serving for five years he joined the family business, being sent to the Bickford factories in Germany and Austria, then returning to the factory in Lancashire before being transferred to the head office of Bickford Smith at Tuckingmill, Cornwall, and joining their board.

This piece of Mr. Smith's personal history is outlined to show that quite early in life he had unusual opportunity to observe the great diversity into which his fellow men are cast: a member of a large family; a craftsman's apprenticeship; work in France, in Austria, and a responsible position in Germany. And a chance to play county cricket which was denied! Such a prelude perhaps suggests that Mr. Smith was destined in due course to be a personnel director. Certainly he has an immense esteem and a great respect for his fellow men and is always interested in their views and opinions. Perhaps only when one comes to know him by working closely with him does one fully realise this side of his character, since his native shyness and modesty tend to obscure it. The great pleasure it gave him to preside over the Workers' Pension Fund meetings and the general conversation at the lunch thereafter, the Central Council meetings as an opportunity for chats with the large number of persons he had come to know on these occasions, his weekly informal gossips with the people in his own village of Mattingley, all bear witness to his respect for other people's opinions. During an official visit to Spain he was quite upset at being unable, through lack of knowledge of Spanish, to hear first-hand opinions of the people in the factories and offices he visited. Mr. Smith may like second-hand furniture, but he has never cared for second-hand opinions.

H. O. Smith is a Cornishman and proud to identify in his own personality those characteristics associated with the county.

Mr. Smith has immense moral courage, and once out of a wealth of circumstance and opinion he is convinced of the rightness of any course of action, he pursues it steadfastly, quite undeterred by any personal considerations. He is quite unable to seek popularity, favours or rewards for himself.

Mr. Smith has been Personnel Director of I.C.I. for a longer period than any other person: except for a period during the war, since 1936 until the close of 1951. The present Chairman and the late Lord Melchett had both acted as direc-

tors in charge of the Central Labour Department, but Mr. Smith was the first director to have responsibility for both Central Labour Department and the Central Staff Department and Pensions Department.

It was Mr. Smith who built up the organisation which is now administered by the Personnel Director, first with Sir Richard Lloyd Roberts, Sir Frank Spickernell, Mr. "Jimmy" King, then with Mr. John Hay, Mr. Bristowe, the late Mr. John Paterson, and Dr. Amor.

All this organisation has required patience, great understanding and the devotion and skill of able people. The policy of a company cannot be created artificially: it arises out of the hopes, the desires and the opportunities of the people concerned with it. Only wise people create a wise policy.

We have seen some of the characteristics which Mr. H. O. Smith brought to his task as Personnel Director. A full measure of credit for the I.C.I. policy in personnel affairs would be denied by him but would be unstintingly accorded to him by all those who have shared the burden and worked towards this goal.

Most stories have a moral. Perhaps this one has. To borrow from R. L. Stevenson: "It is a commonplace that we cannot answer for ourselves until we have been tried. But it is not so common a reflection and surely more consoling, that we usually find ourselves a great deal braver and better than we thought . . . how dangers are most portentous on a distant sight, and how the good in a man's spirit will not suffer itself to be overlaid and rarely or never deserts him in the hour of need."

HEAD OFFICE

Mr. E. J. Barnsley

A luncheon was held at the Rubens Hotel on 28th December to mark the resignation of Mr. E. J. Barnsley from the Company. Mr. E. A. Bingen was in the chair, and among the guests were Mr. A. J. Quig, Dr. C. J. T. Cronshaw, Mr. W. F. Lutyens, Sir Arthur Smout, Mr. J. L. S. Steel and Mr. J. L. Armstrong, as well as many of Mr. Barnsley's former colleagues. Mr. Bingen, Mr. Quig, Mr. Lutyens and Mr. F. C. O. Speyer all paid tribute to the guest of honour in speeches after the luncheon.

Mr. Barnsley, whose retirement took effect on 31st December, joined Kynoch Ltd. as assistant accountant in 1920. In 1923 he was transferred to Nobel Industries Ltd. for taxation and rating work under Sir Josiah Stamp, and four years later he became head of the Taxation and Rating Section. In 1929 he was appointed assistant treasurer, and in 1931 deputy treasurer.

Shortly after returning from a business visit to North and South America in August 1939 Mr. Barnsley was made I.C.I.'s representative in the United States, resident in New York. At the end of that year he was also appointed a director of Canadian Industries Ltd. In 1940 he carried out certain work for the Minister of Supply regarding the British Purchasing Commission in Washington.



(Photo: Fabian Bachrach)

Mr. Barnsley became chairman and president of I.C.I. (New York) Ltd. in 1941, as well as being appointed I.C.I.'s representative on the shareholders' committee of the South American companies owned jointly with du Pont. He resigned the presidency of I.C.I. (New York) Ltd. on returning from America in September 1951.

Mr. Bingen has contributed the following appreciation of Mr. Barnsley:

Mr. Barnsley's career with the Company falls into two distinct phases. In the first phase—up to the outbreak of the war—he was first a taxation expert and more latterly Deputy Treasurer. Those who were brought into contact with him in either capacity soon realised that they were dealing with a man of exceptional ability and financial acumen. Indeed, there were few financial problems, however intricate, to the solution of which he did not contribute something unusual and ingenious which often cut the Gordian knot after lesser mortals had given the problem up, baffled after days of labour.

In the second phase—beginning with the outbreak of war—Mr. Barnsley was the presiding genius and directing force of I.C.I. (New York) Ltd. Numerous high-level problems affecting supplies from the United States, our relations with Government agencies, with du Pont and other companies had to be solved at a time when cabling in code was forbidden and Atlantic travel was at a discount. In those difficult days decisions had to be taken by the man on the spot on his own authority. Mr. Barnsley never spared himself and never failed the Company or the wider national interests involved. Despite his pressing burden of work, he found time too to succour and advise those officials of I.C.I. who were able to visit the United States on urgent Government or civilian business. Many of those I.C.I. visitors will remain grateful to him, while all his colleagues in the Company will join in wishing Mr. and Mrs. Barnsley a happy retirement.

Presentation to Mr. John Hay

On 20th December a presentation was made to Mr. John Hay, Chief Labour Officer, to mark his retirement from the Company. It took the form of an antique wing chair, subscribed for by his Head Office and Division colleagues. The presentation was made by the Chairman, who recalled his long personal association with Mr. Hay and wished him and Mrs. Hay every happiness in the coming years.

New Year Honours

Seven members of the Company received awards in the New Year Honours List.

Mr. M. W. Perrin, Research Adviser in the Research Department, received the C.B.E. in recognition of his work with the Ministry of Supply between 1946 and 1951 as Deputy Controller, Atomic Energy (Technical Policy). Mr. Perrin already holds an O.B.E., awarded him in 1946 for his five years' work in the Directorate of Tube Alloys, the wartime atomic energy project, under Sir Wallace Akers. Although Mr. Perrin has now relinquished his post with the Ministry of Supply, he remains an honorary consultant to their atomic energy division.

Dr. W. H. G. Lake, Manager of the King's Norton No. 3 Works, Metals Division, has been awarded the O.B.E.

Mr. H. R. Payne, who received the O.B.E., is head of the

Central Safety Section of I.C.I. He is vice-chairman of the National Executive Committee of the Royal Society for the Prevention of Accidents, chairman of the National Industrial Safety Committee, chairman of the Works Safety Committee of the A.B.C.M., British representative on the International Labour Office Correspondence Committee on accident prevention, and a member of several committees concerned with Civil Defence.

Mr. Harry Bramhall, Section Operating Manager at Winnington Works of Alkali Division, received the M.B.E. His unflagging energy and the most conscientious way he carries out his duties have largely contributed to the maintenance of a very high rate of output from the plant on which he works. Mr. Bramhall holds another decoration, the Military Medal, which he won as a sergeant of the Cheshire Regiment in the 1914-18 war.

Mr. Horace Joynes, Manager of the Salt Division's Tillington Works at Stafford, was awarded the M.B.E. Mr. Joynes has devoted a good deal of his life to civic and public duties in Stafford. Elected a councillor in 1932, he became Mayor in 1938 and served for four consecutive years. During this time he established the Stafford Soldiers, Sailors and Airmen's Comforts Fund. His present activities include membership of the Stafford Regional Hospital Board, and chairmanship of the Stafford branches of the British Legion and the National Employment Exchange Committee.

Mr. F. T. Webster, awarded the M.B.E., is lifting-gear inspector of engineering works at Billingham. He has been a member of the Amalgamated Engineering Union for twenty years and since 1949 he has been a member of Stockton Town Council.

Mr. J. Wilkes, foreman in the brass tube mill, Allen Everitt Works, Metals Division, received the B.E.M. He has been at Allen Everitt's since 1903, and many thousands of condenser tubes, destined for world-famous liners and warships, have passed through his hands. Mr. Wilkes retires from the Company this month.

ALKALI DIVISION

British Legion Office for Veteran

One of the two assistant staff managers of the Alkali Division, Lieutenant-Colonel George Edward Shard, T.D., has been elected chairman of the Cheshire County Committee of the British Legion. Colonel Shard served in both world wars: during the first he was in France, and in the 1939-45 war he commanded the 27th Searchlight Regiment (London Electrical Engineers) in the Middle East.

Colonel Shard has been connected with Winnington for many years. His father, Dr. P. G. Shard, retired at the end of 1932 after a long record of service and is now a pensioner. He was managing director of I.C.I. (Alkali) Ltd. at the time of his retirement. Colonel Shard worked in China with Brunner, Mond and Co. (China) Ltd. for ten years after the



1914-18 war, later joining the Billingham Division in their London office. It was only after the last war that he came back to Winnington. He has held his present position in the Staff Department since 1947.

BILLINGHAM DIVISION

14,000 Guests for Christmas

In Billingham, as in other Divisions, Christmas was a time for parties: parties for children and parties for grown-ups, small family parties and large parties of friends, parties in homes and in large halls, dinner parties, tea parties, concert parties and pantomime parties.

In all nearly forty parties of one sort or another took place between the middle of December and the end of January.



Father Christmas besieged by eager children at the party held by Sulphate Packing Section of Billingham's Commercial Works

More than 8000 children were entertained at tea parties, pantomimes and cinema shows, and 6000 parents were there to see them have the time of their lives.

To organise entertainment on such a grand scale the committees and social sections of Billingham departments started to plan and scheme months beforehand. More than £4000 had to be raised by voluntary contributions and regular weekly collections. Helpers had to be found to look after the catering and transport arrangements. And volunteers were needed to shepherd the children and wait on them at table.

These helpers, and the thousands of Billingham employees who dipped into their pay packets to raise the money, considered themselves well rewarded by the smiling faces of their 8000 young guests.

Nursing Sister wins Scholarship

In April Miss F. E. R. Jewitt, Division Nursing Sister, will be leaving Billingham to visit the United States and Canada to study industrial nursing in those countries.

Sister Jewitt is enabled to do this by means of a scholarship awarded her in 1951. It is the Sir James Knott travelling scholarship, one of three awarded annually by the Council of the British Commonwealth and Empire Nurses War

Memorial Fund. The Sir James Knott scholarship itself is available only to nurses who have connections with Northumberland or Durham, but to win a scholarship at all Miss Jewitt had to compete with the best nurses in the country. She won a place on the short list of candidates with an essay entitled "What Contribution can Nursing make to Peace and Prosperity?" and was awarded the scholarship after subsequent interviews.

In the U.S.A. Miss Jewitt will undergo a course on industrial nursing specially arranged for her. She is already a State Registered Nurse, a State Certified Midwife and a certified industrial nurse, and has had more than ten years' experience of industrial nursing.



GENERAL CHEMICALS DIVISION

Sir Otho Glover

An impressive ceremony took place in the Council Chamber of the Cheshire County Council at Chester Castle on 6th December when Sir Otho Glover, who has been a member of the Council since 1928 and its chairman since 1948, presented his portrait in oils for hanging on the walls. The portrait, which was painted by Mr. William Dring, A.R.A., and was hung at the Summer Exhibition of the Royal Academy, was unveiled by the High Sheriff of Cheshire, Mr. Humphrey Vernon, M.C. After the ceremony had ended a lunch party was given at the Grosvenor Hotel by the members and officials of the County Council to celebrate the knighthood conferred on Sir Otho in the Birthday Honours List.

As many of our older readers will recall, particularly those in the General Chemicals Division, Sir Otho Glover joined the Castner-Kellner Alkali Company in 1897. He became works manager of Castners in 1920 and in 1924 was appointed a director of the company, though he continued as works manager until 1931. In that year he was appointed Personnel Director of the General Chemicals Division, a post he occupied until his retirement in March 1939.

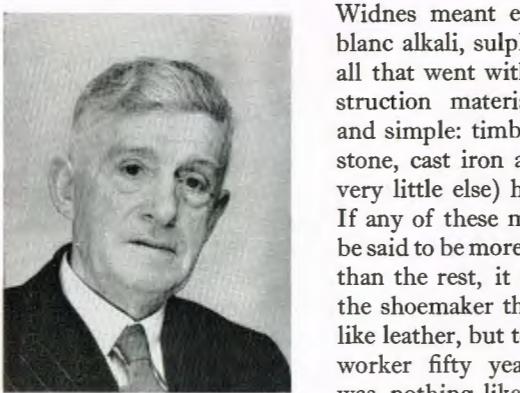
The ceremony was attended by J. K. Batty Esq., J.P., and F. J. Greensill Esq., of the Middlewich Urban District Council. Mr. Batty is Joint Managing Director of the Alkali Division and Mr. Greensill is an Alkali Division pensioner.

A Craftsman Retires

Mr. Ernie Beswick, who retired recently after forty-nine years with the Company at Widnes, is the third in a family line which has served the chemical industry for a century. His father, J. W. Beswick, was presented with the I.C.I. gold medal for forty-eight years' service, and his grandfather's service dated right back to the start of the chemical industry in Widnes.

That is a fine family record, and in making a farewell presentation to Mr. Beswick, subscribed for by his friends and colleagues, Mr. E. J. Stephens was able to review briefly a half-century of changes which have taken place in a chemical

works since Ernie Beswick came as a lad to learn the craft of chemical plumber.



At that time chemicals in Widnes meant essentially Leblanc alkali, sulphuric acid and all that went with them. Construction materials were few and simple: timber, bricks and stone, cast iron and lead (and very little else) had to suffice. If any of these materials could be said to be more indispensable than the rest, it was lead. To the shoemaker there is nothing like leather, but to the chemical worker fifty years ago there was nothing like lead. Its use went far beyond the purposes for which it was essential; for the skill and ingenuity of the lead-burners, born and bred in Widnes and St. Helens, were such that these men could coax lead into the most intricate shapes that the design of any piece of apparatus might demand. Thus it was a commonplace thing to go to the plumbers for all sorts of articles to be fabricated in lead when there was no chemical justification for this material at all. The real justification lay in the fact that a job would be turned out quickly and cheaply—and was as often as not a work of art.

Ernie Beswick was a worthy companion of this order of craftsmen. Not content simply to carry out other people's ideas on how a given piece of apparatus should be fabricated, he wanted to know for himself just what the problem was from the process point of view. He then knew exactly what the fabrication problem was and could proceed to solve it. Nor was he content to accept established ideas that certain difficulties were insuperable. For instance, as one of the pioneers of welding in association with a former laboratory engineer, J. Pritchard, he even welded cast iron at a time when such a process was held to be impossible.

Among the presentations made to Ernie Beswick by his friends and colleagues was the very appropriate one of a fine "briar" pipe—fabricated in lead.

METALS DIVISION

Board Appointment

Mr. G. A. D. Smith was appointed to the Division board on 22nd November, 1951.

Mr. Smith has had a varied experience with the Division. Beginning in 1936 in the Secretary's Department, where he was concerned particularly with staff matters, he subsequently spent some time in the Patent Section and on the commercial side of Lightning Fasteners Ltd. Soon after the beginning of the war he took over liaison duties between the Ministry of Supply and the Division's Metal Production Department, and was concerned with the



distribution of copper shell driving bands and the standardisation of their sizes. When the Blacker bomb contract was undertaken, he was given charge of the section of the Ammunition Department formed to provide the propellant cartridges for this weapon and later for the P.I.A.T. mortar.

Throughout this time and up to his entry into the Army in 1944, Mr. Smith was secretary of the Division Management Committee and for a time of the Kynoch Shop Management Association. He was demobilised in 1947 as a Captain, R.A.O.C., becoming personal assistant to the Commercial Managing Director, and subsequently taking an increasing part in the Division's activities in the trade associations on the non-ferrous metals side.

NOBEL DIVISION

Retirement of Mr. James Wood

At the end of December, after completing over 36 years' service with the Company, Mr. James Wood retired. So ended a distinguished engineering career in the explosives industry.

Mr. Wood's career with the Company began in 1914. During the first world war he was mainly engaged in the erection of new factories. Afterwards he was works engineer at Ardeer for a time before being transferred to Technical Department Engineering in February 1925. From that date onwards he made many technical visits abroad, including one to South Africa to supervise the building of the ammonia oxidation plant at Modderfontein. All this work made him the ideal choice for Superintendent of Factories, I.C.I.A.N.Z. He received this appointment in 1935, and for nearly ten years put his wide experience at the disposal of I.C.I.A.N.Z., planning and supervising the erection of a synthetic ammonia and ammonia oxidation plant at Deer Park and the establishment of an industrial nitrocellulose unit. When the second world war began he was still in Australia, and he joined the late Mr. T. Donaldson at I.C.I.A.N.Z. headquarters, Melbourne, to take charge of the emergency development programme.

When Mr. Donaldson became Director of Munitions Supply in Australia, Mr. Wood carried on the I.C.I.A.N.Z. programme and assisted in the planning and construction of several government agency factories. Mulwala, Ballarat and Villawood factories were built in what had been unfrequented virgin paddocks. He also supervised the erection of the Albion factory, adjacent to the Deer Park Group. The entire Australian project was on the grand scale and called for great versatility of outlook.

Once these expansions were well established, at the end of 1946, Mr. Wood returned to Britain. Since then his extensive knowledge of the explosives industry has been of much help to the younger members in Development Department engaged in planning Nobel Division's post-war expansion. Mr. Wood had a flair for getting the job done quickly and for using existing equipment to the best advantage. As Mr. O. R. Lineham, Development Director, said in his speech of farewell: "Like Wren, he has left his monument around him, and not only in this country but also in South Africa and elsewhere."

A Territorial Veteran

Mr. W. Macintyre, a foreman at the Portland Glass Co. Ltd., is well on the way to realising a lifelong ambition—to



be a battery commander in the Territorial Army. He has just been promoted to the rank of Captain in the Troon Battery of the 330 L.A.A. Regiment of the local "Terriers." Mr. Macintyre's military career began in boyhood, when he enrolled in the Ardeer Factory Cadets. After six years as a cadet he transferred to the Territorials as a trumpeter. In his 22 years' service with them he has passed through every rank, including that of instructor of gunnery at the school of artillery.

During his six years' war service Mr. Macintyre served in the Far East, and was wounded in the Burma campaign.

Girl International Honoured

The celebration of her 21st birthday was not the only highlight in December for Miss Anne McKee, a member of Ardeer's Research Department. Two days before she came of age two presentations were made to her at a party held by the Athletics Section of Ardeer Recreation Club.

First Mr. Ralph Ashcroft, chairman of the Club Executive Council, congratulated Miss McKee on a running career of increasing merit which had been recognised by the national authority last summer when she was chosen to run for Scotland. Thereby she had won distinction for herself and brought honour to the Recreation Club. As was the custom, her name was being added to the Club's internationalist roll in the main entry hall, and he was glad indeed to present to her a life membership card for the club.

The second presentation came from Miss C. Graham, women's welfare superintendent at Ardeer, herself a hockey and athletics international and president of the Scottish Women's Athletic Association. She asked Miss McKee to



Scottish runner Miss Anne McKee (left) receives her presentation from Miss Charlotte Graham

accept from her friends in the Athletics Section a voucher which could be exchanged for a track suit in club colours.

Miss McKee regards her sporting accomplishment with her usual modesty, but her friends believe she will bring even greater honours to the club.

PAINTS DIVISION

At Home to the B.B.C.

Mr. John Bunby, Trade Sales Control, Slough, was selected by the B.B.C. to take part in *Kaleidoscope*, the television quiz programme, on 7th December. A copy of the *Radio Times* placed in the window got Mr. Bunby the job, in accordance with the B.B.C.'s request that anyone who wished to be considered for the programme should display the *Radio Times* in this fashion.

Having satisfied themselves that Mr. Bunby's home was suitable from the point of view of sound, and the producer being very happy with the name *Shaggy Calf Lane*, where John Bunby lives, the B.B.C. unit descended at 6.30 p.m. to connect him with Lime Grove Studios, and quite soon the place was a mass of wires and cables.

In the quiz John Bunby (with the help of nine other people who were present, he admits) scored 25 out of a possible 28. As a result of this broadcast he was invited to take part in a further quiz at Lime Grove television studios on 21st December.

Mr. Bunby only recently returned from his National Service training. He spent it in the Royal Military Police, of whose monthly journal he was assistant editor in his spare time.

PLASTICS DIVISION

'Alkathene' protects Old Masters

In the National Gallery, London, many of the Old Masters painted on wooden panels are being protected by 'Alkathene' sheeting.

The conservation of panel paintings has always been a source of great anxiety to galleries. Unless the rooms in which they hang are air-conditioned, the wooden panels warp in response to changes of humidity in the air; the paint and the ground of chalk or gypsum in glue on which it lies are unable to follow these dimensional changes if they are sudden, and the paint begins in time to blister and may eventually flake off.

Few picture galleries can afford air-conditioning, and they have long sought to slow down the dimensional changes caused by varying humidity by placing some kind of barrier between the air and the back of the panel. Impregnation with beeswax has been tried, and layers of other waxy and oily substances. They are all too permeable to moisture vapour, and they have the disadvantage of being difficult to remove once they have been applied; and where priceless pictures are concerned, irreversible steps are not lightly taken.

The National Gallery, having some 700 panel paintings, is particularly interested in this problem. Recently Dr. A. E. Werner, the Gallery's research chemist, tried sealing off the back of a panel with 'Alkathene' sheeting $\frac{3}{1000}$ in. thick. He exposed the panel to a very dry atmosphere and found that it took forty days to undergo the same dimensional changes as occurred in an unprotected panel in five. The warping, in fact, had been slowed down to a speed at which it could be followed by the paint. Further experiments showed that warping as the result of day-to-day changes in humidity was almost completely eliminated.

Dr. Werner refers to the 'Alkathene' as a buffer against moisture vapour rather than as a barrier. Dimensional changes in the panel still take place, he explains, but so slowly that no harm is caused to the paint.

'Alkathene' has the advantage of being very easily applied. A sheet of it is placed loosely over the back of the panel and sealed to the sides with strips of adhesive polythene tape. It is correspondingly easy to remove.

Among the famous pictures in the National Gallery which have been treated in this way are Rubens' "Le Chapeau de Paille" (30 $\frac{1}{2}$ in. \times 21 in.) and "The Ambassadors" by Hans Holbein the younger (82 in. \times 82 $\frac{1}{4}$ in.). The Rubens, made up of several panels fixed together, was cleaned a short time ago and a crack between two of the panels closed. When it was put back on exhibition the crack opened again under the influence of humidity changes. To bring a halt to this movement an 'Alkathene' backing was applied: "Le Chapeau de Paille" is now secure from the rigours of the English climate.

Sir Wallace Akers, Research Director of I.C.I., is a trustee of the National Gallery and a member of its Honorary Advisory Scientific Committee. This has enabled him to bring together Dr. Werner and members of I.C.I. Divisions on problems with which the latter can help, either because one of the Division's products seems likely to be applicable, or because members of the Division staff have information which may be useful in solving the problem. The use of 'Alkathene' film for backing panels was the result of a discussion arranged in this way between Mr. J. C. Swallow, now chairman of Plastics Division, and Dr. Werner.

Canoeist at Olympic Dinner

Among the guests at the British Olympic Association's annual dinner in November was Dr. M. Gillies, a member of Plastics Division Technical Department. He is president of the British Canoe Union, which is planning to send a team to compete in the Olympic Games at Helsinki this year. He also represents the Scottish Canoe Association on the national organisation.

Dr. Gillies started canoeing in the early 1930's with the Hochschulring Deutsche Kajakfahrer (German university canoeists). The sport has become well established in Britain and America during the last fifteen years, and the British Canoe Union now has about a thousand members. As well as racing activities it organises a national slalom championship and cruising meets on river and sea.

SALT DIVISION

Mr. Tom Carter

One of a family which must still be unique in the number of saltmen it can boast died at Winsford on 30th November. He was Mr. Tom Carter, a shift worker in the vacuum plant and one of seven brothers working at Winsford. Ernie, Rob, George, Albert, Leslie and Jim Carter are left to carry on the tradition started by their father, now a Winsford pensioner.

Tom Carter was known for his lively sense of humour. He had a flair for the comic turn and won a reputation for himself as an amateur comedian in the Moulton Methodist concert party. In the bowling world his standing was high: besides playing for Cheshire on several occasions, he had won most of the trophies put up by the local clubs and was a past winner

of the British Crown Greens Association's Coronation Cup. His gifts as a comedian were apt to show themselves on the green, and he was always a favourite with the onlookers.

Tom Carter was 53 when he died, and had worked for the Company for thirty-nine years.

Diary rescued from a Bonfire

Interesting sidelights are thrown on the early history of Stoke Works in some pages of a diary discovered by Mr. George Slater, a joiner at the works.

The diary belonged to Teddy Barrett, who was a joiner at Stoke in the late nineteenth century. Only a few pages were rescued from a bonfire of rubbish being burnt by Mr. Slater's mother, and some of these were stuck together with blood. This is not evidence of a sticky end for Mr. Barrett, but of his passion for first aid. He was in the original first-aid team at Stoke, and in the early days of cut lumps he probably dealt with more injured fingers and thumbs than anyone else before or since. One of the few people at Stoke whose memory goes back far enough to include Teddy remembers him as "a short man, little over five feet in height, but as wiry and alert as a cricket. His side-whiskers and moustache almost joined to form a hirsute letter W, which seemed to divide his face into two parts."

Many of the diary entries are of purely local interest, such as that of 12th November, 1890: "Stoke Works Station has been lengthened and raised, and not before it was wanted," but there are frequent references to a widely known figure, John Corbett, who was then managing director of the Worcestershire District of the newly founded Salt Union. Corbett had made Stoke Prior's name famous for pure salt in the middle of the century when he bought and developed the salt works there, and he amassed an enormous fortune before he sold out to the Salt Union. A somewhat flamboyant character, he was also a philanthropist on the grand scale, and built homes, schools and hospitals for his salt-workers.

For his French wife Corbett built a vast house in the French style, at a cost of almost £250,000, which he named Impney, and it must have been here that he took the tumble described laconically in Teddy Barrett's entry for Christmas Day, 1892: "Mr. Corbett fell downstairs and broke his arm." Corbett was 76 at the time, but he survived and lived another nine years.

WILTON WORKS

Glasgow Papers, please Copy

During a recent visit to America, Dr. Armit, chairman of Wilton Council, spent a few hours in El Paso, New Mexico. While he was there he went into a restaurant for lunch. What happened next is best described in his own words:

"The waitress saw I was unfamiliar with the menu and asked if I was an Englishman. I said 'Yes,' and she said 'Oh, I like the English!' I said 'I'm not an Englishman really, I'm a Scotsman.' Said she, 'Oh, I love the Scots! I married one. He came from a little place called Glasgow, and he used to speak just like you, but now he has lost all his accent!'"

Apprentice joins Caterpillar Club

Derek Coates, a youth in the Plastics Works, has just become the first cadet in the Air Training Corps to be a member of the Caterpillar Club. This select club is composed

entirely of people who have saved their lives by parachute. Derek Coates' jump took place last summer when the Wellington aircraft in which he was flying collided with another.

Derek, who was presented with his Caterpillar Club badge by Mr. Preston Kitching, C.B.E., chairman of 1869 Cadet Squadron, remains a keen and active member of the squadron despite his unusual experience.

THE REGIONS

Sir Victor Warren in America

In his capacity of Lord Provost of the City of Glasgow, the Regional Manager for Scotland and Northern Ireland, Sir Victor Warren, made a goodwill tour of the United States and Canada with Lady Warren at the end of the year. The visit had the full support and co-operation of the Scottish Council (Development and Industry) and the Scottish Tourist Board. One of Sir Victor's objects was to stimulate an interest in Scotland as an ideal venue for American holidaymakers, while on the other hand he was able to point out the advantages of Scotland as a location for establishing lighter industries. Sir Victor is well able to advocate Scotland's sporting opportunities for tourists, for he is himself a keen fisherman, shot and golfer.

The tour included New York, Philadelphia, Washington, Hamilton, Toronto, Ottawa, Perth, Hull, Montreal and St. John's. In New York Sir Victor was received by the deputy mayor and met the I.C.I. representatives there. Mr. Greville Smith, president of Canadian Industries Ltd., welcomed Sir Victor in Montreal, and Mr. Lank, a vice-president of the company, presided at a Chamber of Commerce meeting which he addressed. At Hamilton, Ontario, Sir Victor saw the C.I.L. fertilizer plant. He was tremendously impressed by all that he heard and saw of C.I.L. Of the whole tour he says: "It was altogether an exciting, educative and marvellous trip."

I.C.I. (EXPORT) PORTUGAL

Presentation to Snr. Antonio Marques

Every I.C.I. visitor to Portugal knows Antonio, the Lisbon chauffeur. At a recent alfresco luncheon party at which all thirteen members of the Lisbon Office were present, Mr.



Snr. Antonio Marques, the Lisbon chauffeur, is second from the right. Mr. Collett is on his left.

W. C. Collett presented him with a watch in recognition of his 20 years' service with the Company. Our photograph was taken during the luncheon party.

In the early days of his service Snr. Antonio Marques—that is his full name—not only drove Mr. Collett but used to assist him with field experiments. Today he is in charge of the Lisbon Office cars and is the proud father of two sons, both in I.C.I. (Export) Portugal, who speak very good English and are carrying on the high standard of service set by their father.

A.E. & C.I. (EAST AFRICA)

Familiar Faces in Kenya

Readers may recognise old friends in the picture printed below, which shows the staff of A.E. & C.I. (East Africa) Ltd. in front of their stand at the recent Royal Agricultural Show at



Left to right: E. G. P. Sherwood, E. S. Duncan, R. Neesham, D. R. Scorer, D. J. Perry, A. Lacey and R. G. Brown

Nakuru, Kenya. Mr. Sherwood was formerly with Central Agricultural Control, Mr. Neesham with I.C.P., Mr. Scorer with Head Office Legal Department, Mr. Perry with Dyestuffs Division, and Messrs. Lacey and Brown with Plant Protection.

* * *

OUR NEXT ISSUE

The March issue will feature some intimate pictures of the Ardeer Recreation Club at Nobel Division. This club can claim to be one of the most successful in the Company, and it has the highest ratio of members to employees of any. Used by young and old, it is a live centre of social activity.

Next we have two colour features, one illustrating the work of Paints Division's Colour Advisory Service, and the other an illustrated article on the growing of roses. Lastly, Mr. Sidney Rogerson, Publicity Controller, writes on an unusual Italian holiday.



From the builder's plot to a . . .

RIOT OF COLOUR

By L. G. Lawrie (Dyestuffs Division)

Colour from flowers in the garden all the year round is not just the impractical dream of a wishful gardener. It can be done—given patience and time and £10 to spend. In this article an enthusiastic and experienced gardener tells you how.

MERITORIOUS it may be to make two blades of grass grow where but one grew before, but it is more satisfying to make a riot of colour from the desert of the builder's plot. You have, I am supposing, such a plot—small, barren and unprepossessing—and not too long a purse, a limited experience of gardening, but an imagination which has filled it with delightful flowering plants and shrubs to give a blaze of colour most of the year.

You are going to have difficulty during the dull months of an English winter, but I can promise you at least a splash of colour here and there even in January and February. Let me further assume that you want a small lawn, a generous herbaceous border, a rose bed and a small rock garden with heathers planted behind, and finally a bed where you can plant a few shrubs and trees, themselves flowering, to act as a background to the garden. Lastly, the expense is not to exceed £10.

In the first place, from the point of view of economy, seed sowing is the cheapest way of stocking a garden, and there are few plants, shrubs or even trees which cannot be easily grown from seed. Trees and shrubs can be ruled out, as it takes too long for them to attain maturity, but most herbaceous plants can be grown to a good size in from two to four years. Even this may be too long to wait, and I would suggest that you start with as many plants as you can afford and also sow seed each year to increase your stock and allow for casualties, so getting the best of both worlds. An extra few shillings will also buy several packets of annual seeds, which can be sown directly in

the beds and provide colourful filling for any empty spaces in the border.

Let us arrange our list of plants according to the seasons, and as this is February we will start with spring flowers.

Spring. The beauty of spring flowers needs no comment, and we naturally think of the large variety of those which grow from bulbs; but alas, bulbs are expensive and often do not give much of a show unless used in masses. One thing, however, you can do. In one corner of the lawn, under the grass, plant a dozen snowdrops (*Galanthus Elephas* is large-flowered) or crocuses in mixed colours, and in the opposite corner a clump of a dozen daffodils such as King Alfred. This will give a gay splash of colour against the green just when it is most appreciated.

As for shrubs and trees, you should have a flowering currant, the large deep crimson *Ribes Pulborough Scarlet* is one of the best, and choose one or two spring-flowering trees such as the crab apple *Malus floribunda*, which by the way makes excellent crab apple jelly, and a laburnum *Vulgare Abschringari*. If you like something out of the usual get *Laburnum Adami*, which is a hybrid between laburnum and broom and gives flowers some of which are yellow and some purple. The early broom *Cytisus praecox* is in flower in April, and the yellow *Forsythia* also flowers this month. You should certainly get two *Berberis*, the *atropurpurea* and *Thunbergii*. These shrubs will provide you with some screen at the end of the garden; but until they grow large, fill out the bare spaces between with annual seeds.

In the herbaceous bed only a few things will be out early, and when planting them see that they are spread along the border and not bunched together in one place. Do not plant single plants except in the case of a very few large varieties, but plant in groups of three, which makes a much better showing. Of the few early plants available the following should suffice—a dwarf and very early iris is the pumila variety Blue Bird; the globe flower *Trollius* is also early, and Golden Queen has a brilliant and large orange flower. Grape hyacinths are easy to grow and increase rapidly, and Heavenly Blue is one of the best. *Primula denticulata*, which is of a lilac shade, can be easily raised from seed. One of the finest blue border flowers—*Anchusa*—flowering a little later, together with a clump of scarlet *Geum Princess Juliana*, should complete the spring show.

It is in the rock garden, however, that you have your best flowering period in the spring, and the following easily grown rock plants should be provided. *Aubrieta Magnificent* (deep red) and *Godstone* (a rich violet-purple) should be planted so that they hang down over the stones. A *Phlox sublata Camila* makes a good show, and let us add *Campanula nitida*, which is attractive and early flowering. Further plants for spring are *Dianthus alpinus*, *Anemone Hepatica*, *Oxalis Adenophylla*, which has pink waxy blooms; and select three *saxifrages*—roses, Mother of Pearl and *primuloides* (Elliott's Variety), the last named being a delightful miniature London Pride.

Summer. Summer flowering plants offer, of course, such a wide selection that only money and space available restrict our choice, but these suggestions give a selection of hardy easily grown plants. To take the herbaceous border first, I would suggest as large plants for the back *Russell lupins*, but to keep within our budget they should be grown from seed, which is easy to do, although this means they will not flower until the following year. Other plants are *Lychnis chalcedonia*, a vivid scarlet, *Helenium Baronin Leiden* and *delphiniums*, which can also be obtained from seed. Further forward in the border plant *Scabious Clive Greaves* and border pinks such as *Mrs. Simkins* with its perfect white flowers, the beautiful purple *Cranesbill Geranium pratense* and the scarlet *Geum Mrs. Bradshaw* along with a *Veronica Shirley Blue*. In front of the border *Catmint Mussine*, whose filmy lavender-blue flowers appear in great profusion over a long period, and *Dianthus Betty Norton* with its deep rose and *Dianthus Grenadier* with red flowers should complete the summer flowering plants.

In the rock garden finish off the planting with the ruby red *Dianthus deltoides*, *Geranium Walney* and *Veronica spicata nana*, all of which will flower on into the autumn, and in the shrubbery add a lilac such as *Hugo Koster*.

When considering the rose garden one is spoilt for choice, and many excellent collections of six roses are offered by dealers. One cannot, however, go wrong with this selection: *Hector Deane* (crimson shaded scarlet), *Talisman* (scarlet and gold and exceptionally vigorous), *Picture* (rose-pink), *Christine* (golden yellow), *Crimson Glory* and *Etoile de Holland* (rich, deep red).

Mix some peat with the soil before planting out your heather bed at the back of the rock garden. About six plants will be sufficient, as they spread quickly once they are established. Some of the best varieties are *Erica carnea*, which is early, *Erica darleyensis* (autumn flowering), *rica vagans grandiflora* and *Erica vagans St. Keverne* (pink flowering throughout the summer).



AUTUMN COLOUR—a picture taken on a plot which only a year ago was left in wilderness by the builders. Dahlias and Geraniums make a brave display.

Autumn. For autumn flowering plant at the back of the herbaceous border some clumps of Michaelmas daisies, using the new varieties which are more compact and have larger and more brilliant flowers than the very tall old-fashioned type. Three of the best are Beechwood Challenger (reddish pink), *Mrs. Ralph Wood* (rose), King George (violet-blue). In addition add a clump of sunflower *Loddon Gold*. These should complete the border and give you a blaze of colour in the background.

Winter. There are only a few shrubs which can be recommended for the winter months. A winter jasmine *Jasminum nudiflorum* will give a brilliant splash of yellow in December and should be set in front of the shrubs or against a wall. The shrub Chinese Witch Hazel of *Hamamelis mollis* has bright cowslip yellow flowers which are scented, and it flowers between December and January.

Climbing Plants. For climbing against the house plant a clematis *Jackmani Gipsy Queen* and a honeysuckle *Lonicera Americana*, which is reddish purple and very free-flowering.

If we now tabulate our plants and attach prices we can see how we stand.

Herbaceous Border		
		s. d.
Spring	6 <i>Iris pumila Blue Bird</i>	2 0
	3 <i>Trollius Golden Queen</i>	7 6
	24 <i>Grape hyacinth Heavenly Blue</i>	3 6
	1 <i>Anchusa</i>	1 6
	3 <i>Geum Princess Juliana</i>	4 6
Summer	3 <i>Lychnis chalcedonia</i>	4 6
	3 <i>Helenium Baronin Leiden</i>	4 6
	3 <i>Pinks Mrs. Simkins</i>	3 0
	3 <i>Geranium pratense</i>	4 6
	2 <i>Dianthus Betty Norton and Grenadier</i>	3 0
	3 <i>Geum Mrs. Bradshaw</i>	3 9
	2 <i>Catmint Mussine</i>	2 6
	2 <i>Veronica Shirley Blue</i>	3 0
	2 <i>Scabious Clive Green</i>	4 0
Autumn	3 <i>Michaelmas daisy</i>	4 6
	2 <i>Solidago Ballardii</i>	3 0
	2 <i>Sunflower</i>	3 0
		£3 2 3

The above plants will, when fully grown, fill a border 20 ft. by 4 ft.

Rock Garden		
		s. d.
Spring	1 <i>Aubrieta Magnificent</i>	1 6
	1 <i>Aubrieta Godstone</i>	1 6
	2 <i>Phlox sublata Camila</i>	3 0
	3 <i>Campanula nitida</i>	4 6
	2 <i>Dianthus alpinus</i>	4 0
	2 <i>Oxalis Adenophylla</i>	3 0
	3 <i>Saxifrages</i>	4 6
Summer	2 <i>Dianthus deltoides</i>	3 0
	2 <i>Geranium Walney</i>	3 0
	2 <i>Veronica spicata nana</i>	3 0
		£1 11 0

These plants are sufficient for a small rock garden about 6 ft. by 6 ft.

Shrubs		
		s. d.
1 <i>Currant</i>	..	1 9
1 <i>Cherry</i>	..	6 0
1 <i>Laburnum</i>	..	5 0
1 <i>Broom</i>	..	5 0
2 <i>Berberis</i>	..	4 0
1 <i>Forsythia</i>	..	2 6
1 <i>Lilac Hugo Koster</i>	..	5 0
1 <i>Jasmine nudiflorus</i>	..	2 9
1 <i>Hamamelis mollis</i>	..	6 0
		£1 18 0

The shrubs should be allowed a bed approximately 20 ft. by 12 ft.

Roses		
		£ s. d.
6	..	1 7 0

The six roses will occupy a small bed measuring 9 ft. by 6 ft.

Heathers		
		s. d.
6	..	8 0
Climbing plants	..	13 0
Bulbs	..	9 0
Seeds	..	10 0
		2 0 0
Total	£9 18 3	

A lot of money? Yes, but—

"I sometimes wonder what the *gardener* buys
One half so precious as the goods he sells"
(Apologies to Omar!)

All the plants recommended are hardy and will grow in practically any reasonable soil, but certain plants which like peat will not grow properly in soil containing lime. These should be planted with some peat and leaf-mould round them. On the other hand, plants which like lime will be found to do quite well in an average soil.

You must remember that you are taking nutrient out of your soil every year, and although it takes a long time before it becomes unfertile you should add a little fertilizer each year both to make up for loss and to improve the growth. I.C.I. Garden Fertilizer can be used, and hop manure is clean; but old horse manure is always safe.

As regards pest controls, their number is legion—do not worry about them except for spraying for greenfly and mildew.



"Out on the Bowsprit"

Photo by S. Pollard (Alkali Division)